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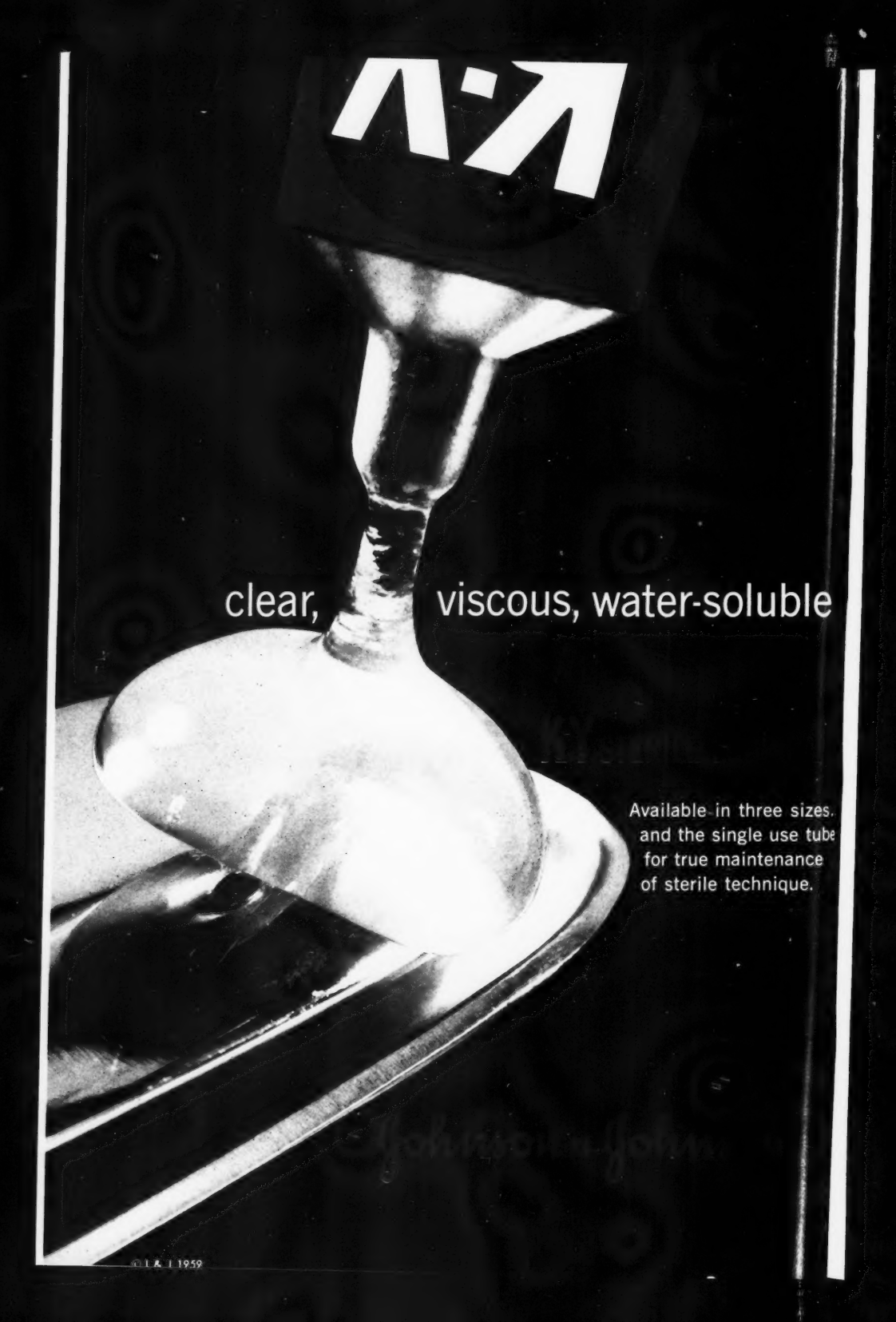
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Low Intestinal Hemorrhage in Children

CHRIS T. OECONOMOPOULOS, M.D.
Boston, Massachusetts

The purpose of this paper is to outline some lower alimentary tract conditions which produce rectal bleeding in infants and children, and emphasize the methods of diagnosis based mainly on the character of the bleeding.

Rectal bleeding, a frequent symptom in the pediatric age group, is present in a wide variety of conditions, and it can be observed at any age. The majority of cases occur during infancy. The significance of rectal bleeding produced by local lesions of the lower gastrointestinal tract is of importance for the proctologist and especially the pediatrician, who is responsible for the care of infants and children. These lesions are always accompanied by passage of blood from the rectum, but are never associated with hematemesis.

In an attempt to group the character of rectal bleeding so as to express more scientifically the different phases of this interesting symptom, we suggest the following terminology: When the passage of blood per rectum is microscopic, the presence of which (occult blood) is confirmed in the stool by guaiac test, this could be called *Coprohemostixis.* When the blood is bright red in small amounts, this could be called *Hematostaxis.* The term *Hematochezia* is considered to be the passage of large amounts of bright red blood with clots. Finally, rectal bleeding could be *Melena,* which is tarry stools, indicating that the blood is from high in the gastrointestinal tract.

Table I outlines the possible character of rectal bleeding produced by local alimentary tract lesions. Many of these may be present in more than one group.

This study is based on an analysis of 100 infants and children between the age of one day and fourteen years, admitted to the Boston City Hospital from 1956 to 1960 with one of the major complaints; namely, the passage of blood per rectum (Table II).

Indications for surgical therapy were found in twenty-three percent of the

From the Department of Pediatric Surgery, Boston City Hospital, Boston 18, Massachusetts.

Presented at the Twelfth Annual Teaching Seminar of the International Academy of Proctology, Miami Beach, Florida, April 23-28, 1960.

TABLE I CHARACTER OF RECTAL BLEEDING CAUSED BY LOCAL G.I. LESIONS

A. COPROHEMOSTIXIS

Swallowed Blood
Hiatus Hernia
Acute Gastritis
Swallowed Foreign Body
Chronic Peptic Ulcer
Duplication
Multiple Polyposis
Blood Dyscrasias

B. MELENA

Esophageal Varices
Duplication
Peptic Ulcer
Polyps of Small Intestine
(Peutz's-Jeghers Syndrome)
Meckel's
Blood Dyscrasias

C. HEMATOCHEZIA

Intussusception
Volvulus
Meckel's
Duplication
Polyps (small and large bowel)
Blood Dyscrasias

D. HEMATOSTAXIS

Polyps (colon)
Multiple Polyposis
Enterocolitis
Ulcerative Colitis
Fissure-in-Ano
Rectal Prolapse
Fistula-in-Ano
Inserted Foreign Body
Hemorrhoids
Anorectal Stricture
Blood Dyscrasias

TABLE II CAUSES OF RECTAL BLEEDING

CONDITION	CASES
Anal Fissure	31
Enterocolitis	24
Unknown Cause	11
Intussusception	8
Polyps	7
Rectal Prolapse	7
Laceration from Foreign Body	5
Proctitis	3
Hemorrhagic Disease Newborn	1
Fistula-in-Ano	1
Primary Thrombocytopenia	1
Hemangioma	1
Total	100

patients. In eleven percent, no cause of bleeding was demonstrated. One year follow-up revealed episodes of rectal prolapse with bleeding in one child two years old.

Clinical Approach to Rectal Bleeding in the Pediatric Age Group

Rectal bleeding in this age group presents, in an appreciable number of cases, a major diagnostic problem and a real challenge to the most experienced clinician. A complete history and a thorough physical examination are important in evaluating rectal bleeding in children. It is essential for diagnosis to know the amount of blood, the color, the duration of bleeding, and the consistency of the stools. Also the presence of bleeding before, during, or after defecation, together with any associated signs and symptoms are imperative. It is better for the examining physician to see the blood himself, because there are certain drugs and foods, such as beets, chocolate, tomatoes, which color the stools.

Occasionally, the pediatrician is faced with the problem of deciding if blood swallowed from a cracked nipple is responsible for melena in an infant. The problem is solved by using the Apt test,[1] in the following manner: a sample of stool is taken and mixed with nine parts of distilled water and this is then filtered or centrifuged to obtain a clear pink solution.

Five parts of this solution plus one part of one percent sodium hydroxide are mixed and the color change is read after one or two minutes. The solution turns yellow-brown in the presence of adult hemoglobin, and remains pink in the presence of fetal hemoglobin.

The newborn infant who still in the

stage of passing meconium, as a rule, does not have melena.

According to Gellis,[2] an infant with meconium stool can have melena, if enough blood is swallowed—approximately 20-30 cc. In an infant whose stools have passed the transitional stage, ingestion of blood from a cracked nipple may produce melena. Rozenfeld and McGrath[3] found that melena in the newborn infant may be produced by as little as 2-6 cc. ingested blood. In adults, it is necessary to ingest 60-100 cc. of blood before melena is produced. In an infant or child, blood from a point high in the gastrointestinal tract may still appear in the stool as bright red blood because except for the newborn period, gastric hydrochloric acid tends to be low.

The cause of rectal bleeding in infants and children in approximately sixty-five percent of cases is found by careful anorectal examination. Therefore, proctosigmoidoscopic examination should be always performed. The technic of sigmoidoscopy in the pediatric age group is simple.[4,5] The preparation is best accomplished with the administration of a Dulcolax® suppository which permits dry sigmoidoscopy. General anesthesia is occasionally used. Sedation may be of value in uncooperative patients. The discomfort which the children complained of during the endoscopy is due to instillation of air and distention of the colon.[5] The chest-knee position is ideal to avoid this complaint. Up to the age of two years, an infant sigmoidoscope 1 cm. in diameter and 12 cms. in length is used. The Solow sigmoidoscope,[6] adequately lubricated, is well tolerated by children over two years. During the procedure, the infant's attention should be distracted by a feeding bottle, and an older child in conversation with the nurse or examiner. Roentgenologic examination is helpful in many cases of obscure rectal bleeding. If blood is bright red, barium enema with air contrast is of value. Emergency x-ray studies are rarely indicated.

Occurrence of both hematemesis and the passage of bright red blood per rectum or on the stools may indicate multiple foci of hemorrhage both high and low in the G.I. tract as in hemorrhagic disease in newborn, leukemia, purpura, aplastic anemia, hemophilia, terminal uremia.[7] The age of a child with asymptomatic bleeding may be of help in differentiating bleeding Meckel's diverticulum from a polyp. Meckel's bleed more commonly under two years of age, and polyps more frequently bleed over two years of age. Bright red blood usually indicates a colonic lesion. If blood is on the surface of the stool, the cause is low in the anorectum. In about sixty percent of cases, digital examination locates a polyp. Painful passage of stools with bright red blood suggests the commonest anorectal condition in infants, namely an anal fissure. In severe rectal bleeding, special consideration should be taken of the circulating blood volume, especially in infants. Loss of 25 cc. of blood in a seven pound baby is equivalent to a hemorrhage of 500 cc. in an average adult.

Occasionally, exploratory laparotomy is indicated in infants and children, especially if one massive hemorrhage occurs which requires transfusion, or if anemia is present of severe enough degree to require repeated transfusions.[8] The success of laparotomy in establishing the diagnosis varies from 50 to 70 per cent and this should be adequately explained to the parents. Sometimes the

problem remains unsolved even after exploratory laparotomy.[9]

I. Conditions of the Lower G.I. Tract Producing Rectal Bleeding

A. Duplication of the Colon — Duplications are congenital malformations of various sizes and shapes located at any part of the G.I. tract from the esophagus to the anus. Twenty percent are found in the lower alimentary tract. These spherical and elongated structures may be lined by gastric mucosa, which secretes hydrochloric acid and pepsin, resulting occasionally in a marginal ulceration of the nearby intestine and subsequent bleeding (Fig. I). The hemorrhage is usually painless and recurrent. The character of the blood is bright red and seldom tarry. The treatment is always surgical removal of the lesion.

B. Intussusception—This disease is rather common in infancy especially between seven and eleven months of age. Intussusception consists of an invagination of a portion of the bowel into the lumen of an immediately adjacent distal portion. The intussusception causes interference with the blood supply of the intestine because the invaginating portion of the bowel—intussusceptum—carries its mesentery inside the intussuscipiens. The resulting congestion of the intussusceptum results in edema and hemorrhage, which appears per rectum characteristically as currant-jelly stools. The blood appears first mixed with the feces and later is mixed with mucous. Early diagnosis and prompt surgical treatment are important. The age of the patient, the history of sudden severe intermittent colicky pains associated with vomiting, the palpation of a sausage-shaped mass in the abdomen, and signs of small bowel obstruction support the diagnosis. Rectal bleeding is usually present in seventy-five percent of cases.

The distal end of the intussusceptum occasionally may be felt by the finger on rectal examination as occurs in sigmoidorectal intussusception (Fig. 2) and should be differentiated from rectal prolapse,[10] The best treatment of this disease is surgical.[5, 11-14]

C. Enterocolitis — Approximately fifteen percent of children have slight amount of bleeding during attacks of diarrhea, which produce a concomitant colitis;[13] in older children passage of blood per rectum, especially in summer, associated with vomiting and diarrhea, is characteristic of this condition. Bleeding may be the predominant feature. Abdominal cramp-like pains are generally present. Sigmoidoscopy shows congested mucosa and bleeding on slight trauma. The treatment is medical management.

D. Ulcerative Colitis — Although the etiology of the disease is unknown, the symptomatology is more severe in children than in adults. The disease is uncommon in infants but if present, is usually fulminating with massive rectal bleeding associated with severe diarrhea, fever, and toxemia. Sloughing ulcers, perirectal abscesses and fissures may be present. In older children, the presence of blood and mucous in the loose stools occurring several times a day, associated with marked weight loss, intermittent diarrhea and abdominal cramps are strongly suggestive of the condition. In the chronic type, the children are thin and undeveloped. On sigmoidoscopic examination the mucous membranes appear friable, red and diffusely granular with minute ulcerations. Barium enema early in the disease course shows colonic irritability; later

FIG. 1 (A) Plain abdominal roentgenogram. The large dense mass in the right lower quadrant proved to be a duplication of the cecum. **(B)** The surgical specimen of the duplication with an ulceration producing bleeding.

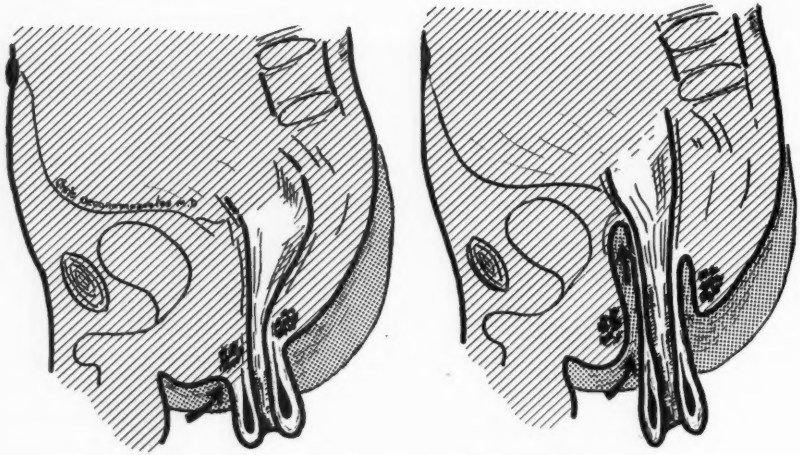
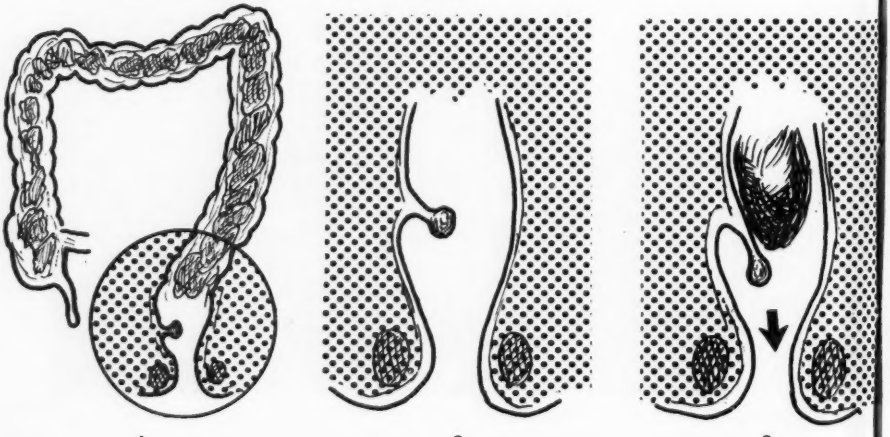


FIG. 2 Sagittal section through the pelvis of a child; note the difference between a sigmoidorectal intussusception and a prolapse of the rectum. In the intussusception there is space between the anal skin and the bowel.

FIG. 3 Mechanism of self-amputation of a rectal polyp.

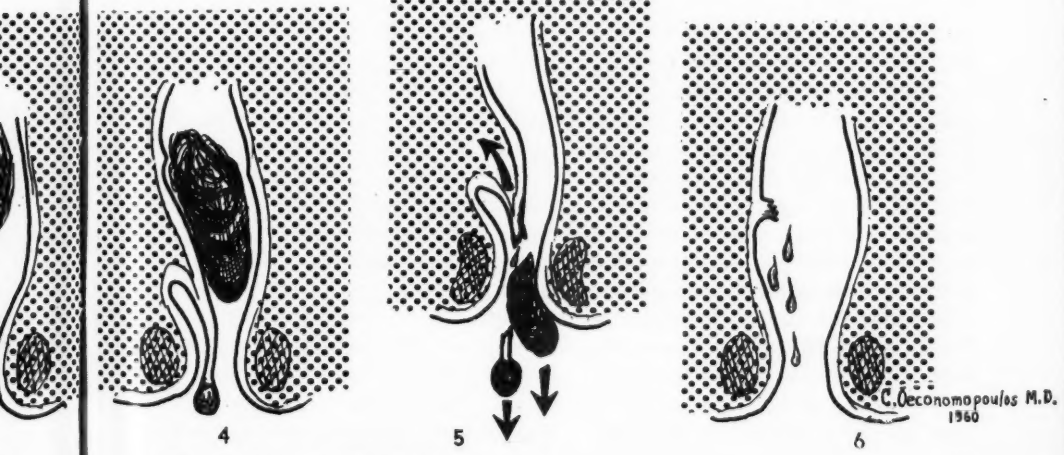


the colon shows loss of haustrations and pseudopolyp formation. The treatment is usually medical with long periods of rest and psychosomatic therapy, low residue diet, vitamin, and iron support. Steroids may be of value to the severely ill children.[15] Severe hemorrhage is an urgent indication for operation. If the disease progresses, subtotal or total colectomy is indicated.

E. Polyps—Polyps in children are benign adenomas encountered more frequently as solitary lesions than multiple. Seventy percent of them are located a few cm. inside the anus in the rectum. The average age of the patient is 4.5 years.[16] The commonest symptom is bleeding, which occurs in small amounts as bright red blood during or immediately after bowel movements. The bleeding is usually painless.[17] Prolapse of the polyp from the anus, described by the mother as a cherry-like mass, may occur. In these cases self-amputation of the polyp is common. In our series we encountered two instances of self-amputation (Fig. 3).

The diagnosis of polyps can be easily made by digital, sigmoidoscopic, and roentgenologic examination.[18] The treatment consists of excision with ligation or fulguration of the base through a sigmoidoscope. If polyp cannot be reached, then an exploratory laparotomy is indicated following two positive barium enemas. These polyps are not dangerous in terms of becoming malignant.

F. Foreign Bodies — Although the swallowing of a foreign body is relatively common in children, rectal bleeding from it is rare. Occasionally, chicken and fish bones, pins, or other objects after being swallowed may pass asymptomatically through the gastrointestinal tract and then lodge in the rectum. They may cause pain, bleeding, or both. The blood is bright in small amount. Re-



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cently a nervous ten-year-old girl had rectal bleeding. On sigmoidoscopic examination, pieces of undigested finger nails were found lodged in the anal crypts leading to local mucosal erosion. Foreign bodies are easily removed by digital manipulation or following visualization through a proctoscope.

G. Anal Fissure is the commonest cause of rectal bleeding in infants. The development of this condition is due to constipation. In infancy, constipation is determined not by the number of stools but by the consistency. There is always a characteristic history of pain on defacation with blood on the surface of the stool or following it. The diagnosis can easily be made by inspection after spreading the buttocks. For internal anal fissures, the lubricated conical tip of a centrifuge tube should be introduced into the anus. By peering down the lumen of the tube, fissures inside the anal margin are readily seen.[8]

Treatment consists in the correction of constipation by stool softeners or dietary changes. The use of digital stretch of the anal sphincter to relieve the spasm and pain, sitz baths, local application of Desitin® and or local anesthetic and antibiotic ointment.

H. Rectal Prolapse may be the cause of slight rectal bleeding (Fig. 4). In the majority of cases the treatment is conservative and directed toward the cause of the prolapse. If the cause of prolapse is due to anatomical defects such as in exstrophy of the bladder, meningomyelocele, etc., surgical therapy should always be used. The method of choice is the Thiersch operation. The method of Thiersch is a simple procedure requiring only a day's hospitalization and being virtually without complications if braided nylon is used instead of wire.

FIG. 4 Rectal prolapse with ulceration and bleeding in an infant.

I. Proctitis may be the first sign of chronic ulcerative colitis. The mucosa is injected and bleeds easily. The treatment consists mostly of dietary management.

II. Less Common Conditions Producing Rectal Bleeding

A. Familial Multiple Polyposis of the Colon—Multiple polyps must not be confused with this disease which is familial. Here the entire mucosa of the involved bowel is studded with sessile and pedunculated polyps (Fig. 5). Most of them are located in the rectum and sigmoid. The condition is rarely symptomatic in infancy, but in childhood its presence is indicated by a mucinous intermittent diarrhea with bright red blood on the surface of the stools and weight loss. Occasionally pronounced bleeding may occur. Sigmoidoscopic

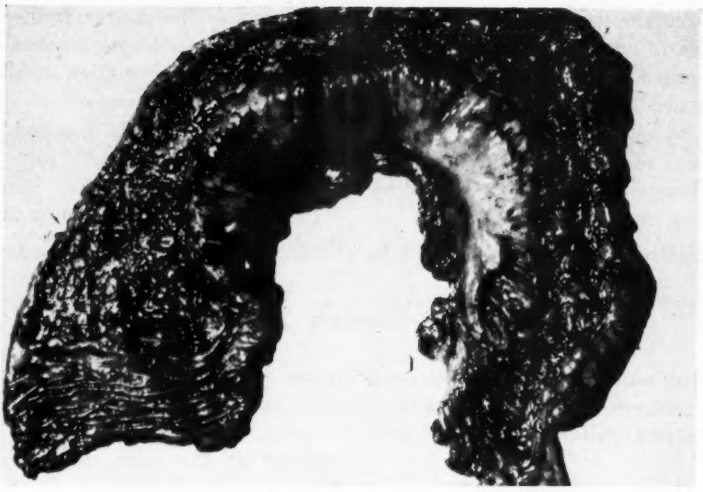

FIG. 5 Terminal colon with familial polyposis in a child.

and roentgenologic studies are diagnostic of the disease. When a parent has multiple polyposis the child should be studied with barium enema after the age of five. The clinical importance of these polyps is that they tend to be malignant after puberty. After the age of ten, a subtotal colectomy with ileoproctostomy or of permanent ileostomy is the treatment of choice at present.

B. PEUTZ'S-JEGHERS SYNDROME — This syndrome consists of polyposis of the small intestine or generalized throughout the entire intestinal tract and not with polyposis limited to the colon, accompanied by melanin spots of the skin and oral membranes. It occurs usually in brunettes with brown or dark-blue eyes. The clinical importance of these is that they are easily recognizable and noted often first in childhood. Melena may be present as warning manifestation. The child may have repeated intussusceptions. The polyps do not become malignant in contrast to familial polyposis. The treatment consists of blood transfusions, or resection of the segment of the involved bowel.

C. HEMANGIOMAS seldom are present in the lower G.I. tract and may produce bleeding. They usually are associated with similar cutaneous lesions. The proctologist should be aware of this possibility.

D. HEMORRHOIDS, especially internal, are seldom seen in infants and young children. They rarely occur before the age of four and are associated with constipation or with block of the portal circulation. Hemorrhoids do not thrombose as in adults. Duhamel[19] believes that in infants, hemorrhoids exist as a distinct clinical entity.

III. Blood Dyscrasias The presence of blood dyscrasia may be first manifested by rectal bleeding. If such conditions are suspected a thorough hematologic investigation is indicated.

HEMORRHAGIC DISEASE IN THE NEW-

BORN occurs in the first week of life and responds to administration of 2 mgms. of vitamin K.

PRIMARY THROMBOCYTOPENIA responds to splenectomy. One of our patients was admitted primarily for severe rectal bleeding and finally was cured by removing his spleen.

ANAPHYLACTOID PURPURA (HENOCH-SCHÖNLEIN)—The danger from development of intussusceptions should be kept in mind. The condition usually responds to steroids therapy.

HEMOPHILIA is rarely responsible for rectal bleeding. This usually starts with hemarthroses.

LEUKEMIA produces bleeding late in the disease.

Summary

A brief outline of the methods used for the diagnosis of rectal bleeding in infants and children has been presented.

The most common conditions of the low G.I. tract producing bleeding per rectum are discussed.

The majority of these conditions in the pediatric age group, unlike the adult, respond to conservative treatment. The average hospitalization of these patients was eleven days. Severe bleeding was observed in only nine percent of the cases, the majority having a small amount. From our series of one hundred cases indications for surgical management were found in twenty-three percent of the patients.

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Pseudomembranous Enterocolitis

Further Observations on the Value of Donor Fecal Enemata as an Adjunct in the Treatment of Pseudomembranous Enterocolitis.

DONALD C. COLLINS, M.D., F.A.C.S., F.I.A.P.
Hollywood, California

Pseudomembranous enterocolitis has received increasing recent attention in the world's medical literature since Billroth[1] first described this clinical entity in 1867, in a patient who had undergone thyroid surgery. This disease is encountered infrequently, but may be a predominately fatal one. It is often seen postoperatively in patients suffering from colonic malignancy, or in those who have received injudicious administration of broad-spectrum antibiotics. Rarely, this pathologic entity may be observed in medical patients. Surgeons the world over are now more alert in recognizing the earlier stages of pseudomembranous enterocolitis, thereby instituting earlier specific therapy, and thus saving more lives.

Excellent reviews of this disease, its many ramifications, and its specific treatment have been contributed by Johnson and his co-workers,[4] Weisman and Twitchell,[6] and especially by Becker and Brayton.[2] The reader is referred to these excellent articles for a general discussion of the problems involved.

More recently, Eiseman et al.[3] proposed the use of donor fecal enemata as an adjunct to the treatment of pseudomembranous enterocolitis. This last contribution has evoked considerable discussion "pro" and "con." Their original report concerned four patients successfully treated by this method of therapy. Eiseman et al.[3] concluded, in part: "In each instance, the clinical course was markedly improved and the Micrococcus pyogenes (Staphylococcus) which grew in pure culture prior to the treatment disappeared from the stools and was replaced with normal colonic nonpathogens following such therapy. It is suggested that this simple yet rational therapeutic method should be given more extensive clinical evaluation."

A year and a half has passed since the publication of this article. It was thought that it might prove of interest to report a recent survey made of twenty-four hospitals in the Los Angeles Area and the opinions of twenty-six doctors (mostly hospital pathologists) as to their

TABLE I LOS ANGELES HOSPITALS IN WHICH DONOR FECAL ENEMATA WERE USED AS AN ADJUNCT THERAPY IN PSEUDOMEMBRANOUS ENTEROCOLITIS

HOSPITAL INTERVIEWED	DOCTOR INTERVIEWED	DATE OF INTERVIEW	NO. PTS. SO—Rxed.	FAVORABLE REACTION OF CITED DOCTOR	DEATHS
Crenshaw Hospital, 3831 Stocker St.	Milton Rosenthal	6/22/60	2	Yes	0
Hollywood-Presbyterian, 1322 N. Vermont Ave.	Franklin V. Hinckle	6/22/60	1 (GYN.)	Yes	0
Los Angeles County-General Hospital 1200 North State St.	Dorothy P. Tatter	6/22/60	1	Yes	0
DITTO, C. M. E.-Surgical Service	Clarence E. Stafford	6/20/60	2 (Several).	Yes	0
St. Vincent's Hosp., 2131 W. Third St.	James Caylor	6/22/60	1 (Cardiac).	Yes	0
Glendale Sanit. & Hosp., 1509 E. Wilson St.	Paul Scherer	6/22/60	3	Yes	0
Wadsworth General Hosp., V.A. Medical Center	Morton Grossman	6/24/60	2	No	0

personal evaluation of this mode of therapy. Table I summarizes the positive data derived from this survey and is self-explanatory.

In addition to the data shown in Table I, the following additional information is given: Seventeen other hospitals (The California Hospital, The Cedars of Lebanon Hospital, The Children's Hospital, The Hospital of The Good Samaritan, Mt. Sinai Hospital and Clinic, Queen of Angels Hospital, U.C.L.A. Medical Center, White Memorial Hospital, Behrens Memorial Hospital—Glendale, Huntington Memorial Hospital—Pasadena, St. Luke's Hospital—Pasadena, Valley—Presbyterian Hospital—Van Nuys, St. Joseph's Hospital—Burbank, St. John's Hospital—Santa Monica, The Santa Monica Hospital—Santa Monica, The Daniel Freeman Memorial Hospital—Inglewood, and The Centinela Valley Community Hospital—Inglewood) were interviewed and no patients were known to have received this donor fecal enemata therapy. Twenty-six doctors (mostly hospital pathologists) at these various hospitals were asked if they approved of this adjunct mode of therapy, provided adequate safeguards were set up by the Hospital Administration and the Clinical Laboratory *before* the institution of this treatment. Twenty-one (80.77 percent) were favorable, three (11.54 percent) were violently opposed, and two (7.69 percent) had doubts and reservations at the present time.

Summary

1. A report is made on a recent survey conducted of twenty-four hospitals in the Los Angeles Area, and twenty-six doctors (mostly hospital

pathologists) as to whether donor fecal enemata had been used as an adjunct treatment in cases of pseudomembranous enterocolitis in their hospitals, and if the doctors so interviewed approved of this adjunct type of therapy, as advocated by Eiseman et al.[3] in November 1958.

2. Twelve additional patients were discovered who had received donor fecal enemata with no ensuing deaths, in those so treated!

3. Of the twenty-six doctors interviewed at these various hospitals: twenty-one (80.77 percent) were favorable, three (11.54 percent) were violently opposed, and two (7.69 percent) had doubts and reservations—to the employment of this type of treatment.

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7046 Hollywood Boulevard

CLINI-CLIPPING

A. Rectovaginal Fistula

B. Vesicovaginal Fistula

Changing Resistance of Microorganisms

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Brookline, Massachusetts

Bacterial susceptibility testing to antibiotics has been, and still is, a reliable guide in the selection of the appropriate antibotic for therapy.

Reliability of bacterial susceptibility testing, regardless of the method employed, becomes a function of qualified interpretation of such *in vitro* tests. In other words, if we indicate that an organism is susceptible to a specific antibiotic, and the patient responds favorably, there is good correlation. Chronic urinary tract infections provide an excellent source for such observations, since most cases require some form of therapy to produce clinical changes: that is, such patients usually do not improve spontaneously. Secondly, these infections are rarely fatal, thus providing a time element for observing the effects of antibiotic therapy against the incriminating organisms. Although most of our experience has been in the field of chronic urinary tract infections, I believe there is a certain degree of parallelism between the field of proctology and that of urology as far as isolated bacteria are concerned. Although some patients do improve spontaneously, many cases require some form of therapy to produce clinical changes, even, at times, surgery. If I understand correctly, these infections are rarely fatal, thus providing, as in chronic urinary tract infections, a time element for observing the effects of antibiotic therapy.

One might raise the question as to how one would use antibiotic therapy in cases of pruritus ani, for instance. There has not been very much literature in this field, although we have had some experience. On an empirical basis, the bacterial flora were isolated from the stool specimens and the predominating organism tested against various antibiotics for susceptibility. On this basis, oral therapy with chloramphenicol was used in several cases of pruritus ani with surprisingly satisfactory results,

Presented at the Twelfth Annual Teaching Seminar of the International Academy of Proctology, Miami Beach, Florida, April 23-28, 1960.

particularly when *Proteus sp.* were incriminated. Another reason why our experience in chronic urinary tract infections might carry over into the field of proctology is the fact that the organism in many urinary tract infections is derived from the G.I. tract, so that we are frequently dealing with the same type of organisms as far as potential antibiotic therapy is concerned.

Fresh, clean, voided, urine specimens from males, and catheterized specimens from females, provided the primary source of organisms which were isolated, identified, and tested for susceptibility to one or more of the antibiotics discussed here. Microorganisms isolated and tested included those found before, during, and subsequent to treatment. The agar diffusion technique, employing commercial disks containing specific concentrations of the various antibiotics, provided the basis for the following comments on susceptibility and resistance. Only qualitative, and not quantitative, interpretation has been applied to the results with respect to a therapeutic regimen. With each of the antibiotics under consideration, standardization and uniformity of interpretation were determined by comparison with the minimum inhibition concentration of the serial tube dilution technique, as well as by correlation with clinical response.

Two basic considerations should be stated here:

(1) those organisms primarily isolated in urinary tract infections, such as *Staphylococcus aureus* (coagulase-positive or coagulase-negative), enterococci, *Escherichia coli*, *Aerobacter aerogenes*, *Pseudomonas aeruginosa* and *Proteus species*, were apparently either definitely resistant or definitely susceptible; it was rare to encounter a questionable reaction; and

(2) no proven incidence of change in resistance *in vitro* during therapy has been noted, but the evidence of removing the susceptible strains and permitting the resistant varieties to emerge, was real.

Against the above mentioned organisms, the following chemotherapeutic agents have been tested: penicillin, streptomycin, chlortetracycline (Aureomycin®), oxytetracycline (Terramycin®) and chloramphenicol (Chloromycetin®) since 1951; nitrofurantoin (Furadantin®) since 1953; tetracycline and erythromycin since 1954; novobiocin and oleandomycin since 1956; and kanamycin (Kantrex®) since 1958. The organism isolated was considered susceptible if it showed a two-millimeter zone of inhibition around a disk of 2 units of penicillin, 10 micrograms of streptomycin, 30 micrograms of chlortetracycline, oxytetracycline or tetracycline, 10 micrograms of chloramphenicol, 2 micrograms of erythromycin or oleandomycin, 15 micrograms of novobiocin, or 30 micrograms of kanamycin; or a five-millimeter zone around a 100 microgram disk of nitrofurantoin. Although tests were made against streptomycin from 1953 to 1956, they were not continued beyond that period because this agent was so rarely used by the physician except in specialized cases such as tuberculosis. Streptomycin is therefore omitted from this discussion. With respect to neomycin, bacitracin and Polymyxin, our experience has been limited and our data is scanty; therefore, these three antibiotics also do not enter into this discussion. It is well known that they are good agents, and neomycin has been, and still is, used

PERCENTAGE OF MICROORGANISMS SUSCEPTIBLE TO VARIOUS CHEMOTHERAPEUTIC AGENTS, 1951-1959

Agent	Year	S. Aureus	Enterococcus	E. Coli	A. Aerogenes	Ps. Aeroginosa	Proteus Sp.
PENICILLIN	1951	60	55	—	—	—	—
	1952	26	28	0	0	—	0
	1953	24	24	0.5	2	2	2
	1954	13	17	0.9	1	0	0
	1955	18	17	0	0	0	0
	1956	71	55	7	0	0	0
	1957	51	25	1	0	0	0
	1958	57	41	0	0	0	0
	1959	60	36	0	0	0	0
CHLORTETRACYCLINE	1951	56	65	—	—	—	—
	1952	75	62	94	88	32	62
	1953	69	69	89	89	41	23
	1954	59	50	68	60	2	12
	1955	53	31	44	41	1	2
	1956	53	44	54	36	32	13
	1957	54	47	68	31	35	10
	1958	61	45	64	40	20	14
	1959	60	38	57	36	3	3
OXYTETRACYCLINE	1951	64	75	87	72	49	17
	1952	77	49	96	91	72	26
	1953	55	60	85	88	76	22
	1954	47	43	63	51	3	7
	1955	53	29	46	38	0	1
	1956	47	30	55	38	32	12
	1957	39	33	71	34	58	12
	1958	52	40	63	24	71	15
	1959	56	38	63	35	80	3
TETRACYCLINE	1954	—	—	74	—	—	—
	1955	52	23	58	46	—	4
	1956	47	30	54	38	32	14
	1957	42	33	72	36	45	12
	1958	57	42	65	31	43	15
	1959	66	38	63	35	6	3
CHLORAMPHENICOL	1951	—	—	94	84	49	83
	1952	98	91	100	87	41	71
	1953	89	88	96	80	51	74
	1954	78	72	84	63	5	48
	1955	72	75	80	57	5	35
	1956	78	74	86	71	20	43
	1957	82	66	84	53	11	46
	1958	82	84	90	69	0	59
	1959	91	82	90	76	0	53
NITROFURANTOIN	1953	100	100	96	73	33	90
	1954	86	88	85	65	2	49
	1955	90	96	85	62	10	55
	1956	82	93	80	72	14	40
	1957	96	95	93	60	13	31
	1958	100	100	83	61	0	23
	1959	90	94	90	67	0	14

extensively in bowel surgery.

There have been more than 20,000 examinations made for bacterial susceptibility on approximately 4,000 microorganisms, using the conditions cited (See Charts I and II). Factors such as concentrations of organisms, time and temperature of incubation, and various concentrations of antibiotics, as well as various types of disks, have been considered for the final evaluation.

Results and Discussion Let us consider the various organisms that have been encountered and see how they have been behaving with respect to their incidence when tested against the various antibiotics over the years under consideration.

1. STAPHYLOCOCCUS AUREUS: This organism has probably been subjected to more study, comments and accusations than any other in recent years. With reference to resistance of strains in certain institutions, such comments are probably justified. In institutions where epidemics or outbreaks have not occurred, however, it has been found that the incidence of coagulase-positive staphylococci, including those resistant to penicillin and other antibiotics, and those of various phage types, compares very closely to that in non-hospitalized individuals or ambulatory patients. In this series, *S. aureus* encountered primarily in non-hospitalized patients has demonstrated little or no increase in incidence of strains resistant to penicillin since 1952. The frequency of isolation of this organism did not influence the incidence of resistant strains. Since 1956, particularly, the incidence of strains susceptible to penicillin has been relatively constant (approximately 60%), while the number of isolates was actually less prior to this period (See Chart III). There seems to be no particular change in the trend of resistant strains appearing in 1960, and there has actually been no significant change in the incidence of *S. aureus* strains resistant to other antibiotics. In the last two or three years, it has been found more expedient to determine the coagulase activity of the isolated staphylococcus, rather than to depend upon its resistance or susceptibility to penicillin or other antibiotic, as the primary factor in determining its potential pathogenicity and probable response to antibiotic therapy. Coagulase-positive strains of certain phage types are apparently harder to eradicate in a hospital population where staphylococcal infections are chronic or explosive, than where the clinical manifestation is sporadic or occasional, even though the same incidence and types of staphylococci are found. Expressed in another manner, one may find coagulase-positive staphylococci which are resistant to penicillin and other antibiotics, but without susceptible individuals, and with the maintenance of good housekeeping, the incidence of staphylococcal infections is low. A high incidence of coagulase-negative strains usually suggests a low degree of virulence or pathogenicity and it follows that they are more amenable to antibiotic therapy where such is indicated. The problems encountered with ambulatory patients or out-patients are entirely different from those with in-patients, or with infections originating from within an institution where the incidence of coagulase-positive strains of *S. aureus* tends to be high.

2. ENTEROCOCCUS: The incidence of strains of enterococci resistant to the various antibiotics has paralleled that of *Staphylococcus aureus*. From 1951 to

CHART I NUMBER OF ORGANISMS TESTED FOR SUSCEPTIBILITY

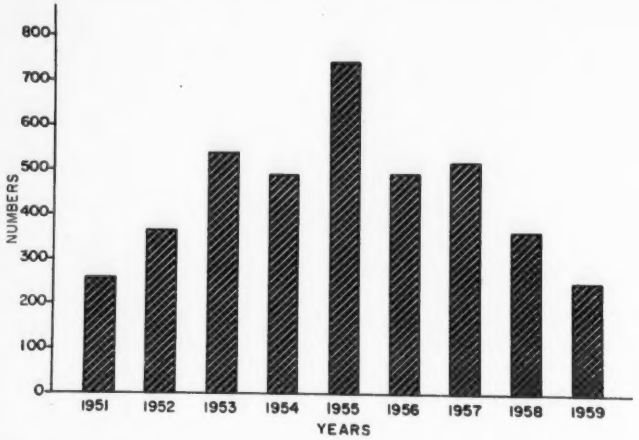


CHART II TYPES OF ORGANISMS TESTED FOR SUSCEPTIBILITY

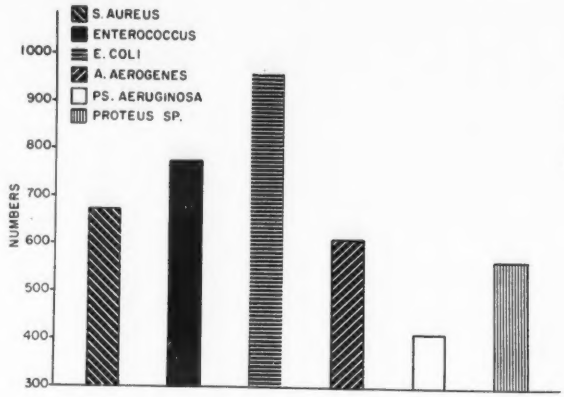


CHART III PERCENTAGE OF STAPHYLOCOCCUS AUREUS STRAINS SUSCEPTIBLE

('56 THROUGH '59)

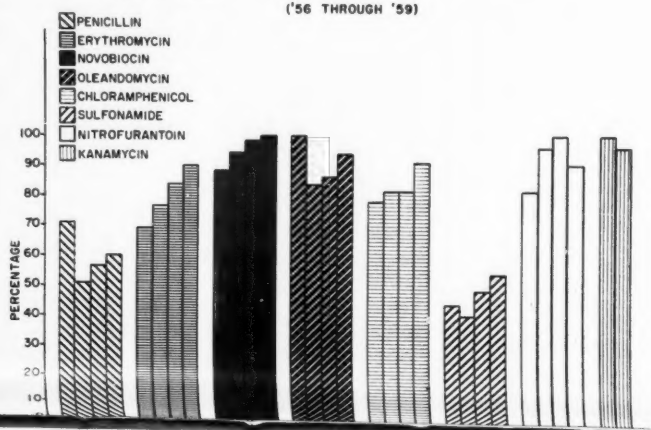
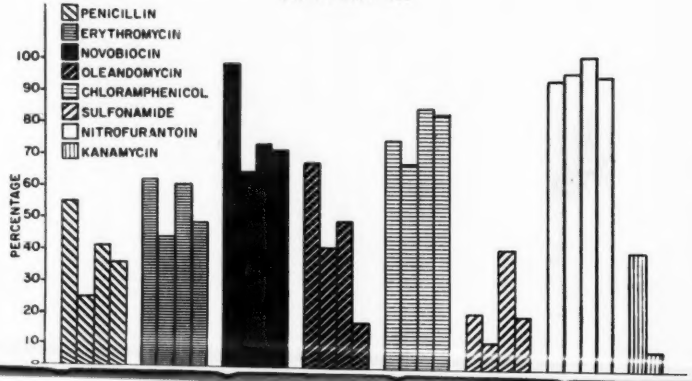


CHART IV PERCENTAGE OF ENTEROCOCCUS STRAINS SUSCEPTIBLE

('56 THROUGH '59)



1955, there appeared to be a trend toward an increase in the incidence of resistant strains. This parallels the period of the increasing promiscuous use of antibiotics which reached its peak in 1955. This trend, however, has reversed itself since 1955, again paralleling the more selective use of antibiotics (See Chart IV). In general, against all of the therapeutic agents, with one exception, there has been little change in the incidence of resistant enterococci. Chloramphenicol and nitrofurantoin were consistently the most active against this group of bacteria. The incidence of strains susceptible to the tetracyclines was lower than to all of the other antibiotics including penicillin, particularly in the last three and a half years, and there has been essentially no change in this incidence. Although the newer antibiotic, kanamycin, has been found to be very effective against infections of staphylococcal origin, it has been found to be generally ineffective against enterococci. Oleandomycin alone stands out in its decreasing effectiveness against strains of enterococci, while erythromycin continues to remain relatively effective, although it is not necessarily the antibiotic of choice.

3. ESCHERICHIA COLI: Consideration of drug selection against this type of infection is usually confined to the broad spectrum antibiotics, nitrofurantoin and, more recently, kanamycin (See Chart V). Since 1953, the incidence of *E. coli* isolates has been decreasing, while the incidence of strains susceptible to the tetracyclines and chloramphenicol has remained relatively constant. Actually, the effects of chlortetracycline, oxytetracycline and tetracycline on *E. coli* appeared to be nearly identical. There may be a difference, academically, wherein tetracycline and oxytetracycline appear more effective against Gram-negative organisms than does chlortetracycline, while chlortetracycline appears more effective against Gram-positive organisms. This difference, however, is statistically insignificant. Chloramphenicol, nitrofurantoin and, more recently, kanamycin, have retained maximum antibacterial effectiveness against *E. coli*.

4. AEROBACTER AEROGENES: There has been increasing evidence, clinically, of ineffectiveness of the various antibiotics against this organism in spite of the apparent lack of a corresponding decrease in incidence of susceptibility by *in vitro* testing. It may be seen in Chart VI that there has been little or no change in resistance to the tetracyclines, chloramphenicol and nitrofurantoin. Kanamycin appears at present to be the most effective, although it is too soon to be dogmatic as to whether this will continue. More recently, dechlormethyltetracycline (Declomycin®) has been found to be very effective against *A. aerogenes*.

5. PSEUDOMONAS AERUGINOSA: The tetracyclines were more effective against this organism than were chloramphenicol and nitrofurantoin. This was just the reverse of their activity against *E. coli* and *A. aerogenes*. It is interesting to note that the incidence of resistant strains of *Pseudomonas aeruginosa* was extremely high in 1954 and 1955. Since 1956, the pattern of the tetracyclines against *Ps. aeruginosa* has been most interesting, academically, at least, in pointing out differences between chlortetracycline, oxytetracycline and tetracycline (See Chart VII). This phenomenon has not been apparent with other organisms: that is, there was a cross

CHART V PERCENTAGE OF E. COLI STRAINS SUSCEPTIBLE ('56 through '59)

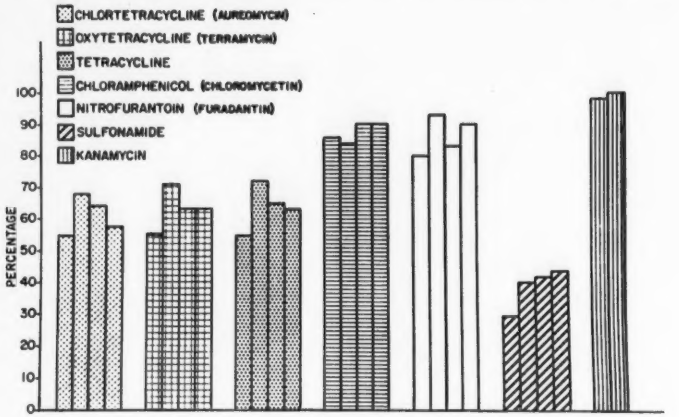


CHART VI PERCENTAGE OF A. AEROGENES STRAINS SUSCEPTIBLE

('56 THROUGH '59)

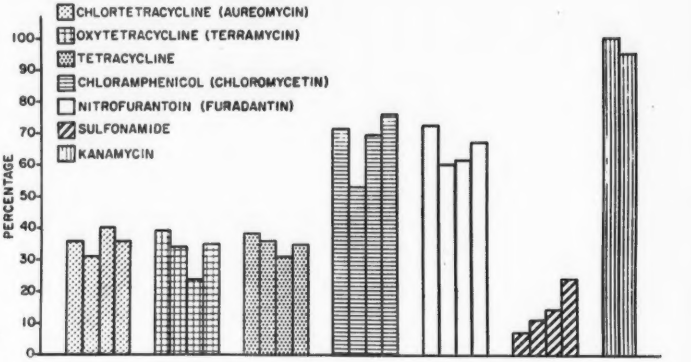


CHART VII PERCENTAGE OF PS. AERUGINOSA STRAINS SUSCEPTIBLE

('56 THROUGH '59)

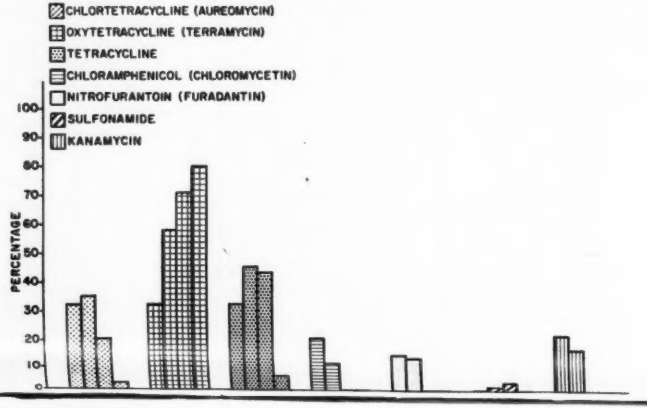
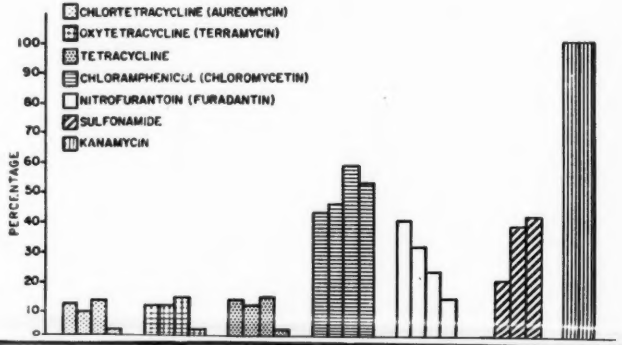


CHART VIII PERCENTAGE OF PROTEUS SP. STRAINS SUSCEPTIBLE

('56 THROUGH '59)



resistance and a cross susceptibility. Against *Ps. aeruginosa*, however, oxytetracycline has been the most active, and most strikingly so during 1959. In fact, with the similarity of many of the Gram-negative organisms isolated, marked susceptibility to oxytetracycline aids materially in identifying this strain. To date, the new antibiotic, colistin (Coly-mycin) shows great promise against *Ps. aeruginosa*.

6. PROTEUS SPECIES: When one encounters a *Proteus sp.*, particularly in mixed infections in which a *Proteus sp.* is the predominating organism, it usually is a strain of *Proteus mirabilis* or *Proteus vulgaris*, a high urease producer, as contrasted to other species such as *Proteus morganii* or *Proteus rettgeri* which are apparently more susceptible to antibiotics when encountered. The incidence of strains of *Proteus sp.* susceptible to the tetracyclines remains consistently low (See Chart VIII). There has been a gradual but consistent decrease in the incidence of strains of *Proteus sp.* susceptible to nitrofurantoin which was originally considered fairly effective. Conversely, the incidence of strains susceptible to novobiocin has appreciably increased. The apparent increase of incidence of Proteus strains susceptible to sulfonamides *in vitro* has not proved to be true as far as clinical response has been concerned. Interpretation of susceptibility to sulfonamide by the disk method is subject to variation. To date (during 1958 and 1959) kanamycin has appeared to be effective against many Proteus strains *in vitro* and this has been borne out by clinical response.

Summary

In general, chloramphenicol (Chloromycetin®) continues to be the most active most frequently against the organisms under consideration, with the exception of Pseudomonas aeruginosa. *Oxytetracycline (Terramycin®), one of the older antibiotics, still appears to be most effective against this organism. Novobiocin and chloramphenicol appear to be most effective against* Proteus sp., *while nitrofurantoin (Furadantin®) continues to become less and less effective against these organisms.*

The decrease in the incidence of E. coli *and* A. aerogenes *strains susceptible to the tetracyclines, which occurred until 1955, leveled off in 1956, 1957, 1958, and 1959. This did not apply, however, to* Proteus sp. *and* Pseudomonas *strains in which incidence of susceptibility has continued to decrease. Chlortetracycline (Aureomycin®) and its recent counterpart, demethylchlortetracycline (Declomycin®), appear to be more active against staphylococci and enterococci, while tetracycline appears more effective against the Gram-negative organisms as a whole. There has been a gradual decrease in strains of* Proteus sp. *and* Pseudomonas aeruginosa *susceptible to the broad spectrum antibiotics as well as to nitrofurantoin, with the exception of oxytetracycline to which the pseudomonas strains are susceptible. Although it is too early to predict, at least during 1959, in all instances in which* Aerobacter aerogenes *was isolated from a patient with chronic urinary tract infection, the patients*

have responded favorably to kanamycin (Kantrex®).

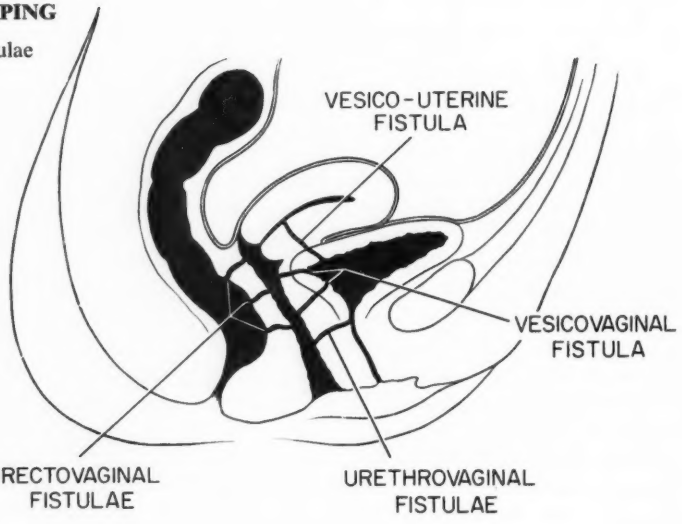
Several therapeutic agents (penicillin, erythromycin, novobiocin, chloramphenical, oleandomycin and nitrofurantoin) indicate effectiveness against S. aureus. *Yet, in most instances, application clinically introduces, or potentially introduces, an increased incidence of resistant strains. Nitrofurantoin and chloramphenicol remain chemotherapeutic agents of choice for enterococcal infections.*

If the trend continues, kanamycin may become an antibiotic of choice for the organisms under consideration with the exception of the enterococci and Pseudomonas aeruginosa.

Sias Laboratories, Brooks Hospital

CLINI-CLIPPING

Vaginal Fistulae



X-Ray Examination of the Colon

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Suffern, New York

It is the purpose of this report to illustrate the following types of diagnostic problems.

- ***Inability to visualize low lesions on x-ray (i.e. distal sigmoid, rectum and anorectal area).***
- ***Difficulty in differentiating a benign from a malignant obstructive lesion of the sigmoid.***
- ***Misleading symptomatology for which upper gastrointestinal studies are requested.***
- ***Inconclusive diagnosis resulting from failure to give complete clinical data to the radiologist.***
- ***Overconfidence in a negative report with too long delay before repeat examination.***

The reliability of radiologic methods of large bowel diagnosis is so well established that certain pitfalls are liable to be overlooked. In a recent analysis[1] of one hundred consecutive patients operated upon for cancer of the colon, thirty-one percent were found to have come too late to be given a reasonable chance of cure! Causes of delay were listed as failure of the physician to recognize the importance of symptoms, a false security due to overconfidence in the accuracy of an x-ray examination, and failure to supply the radiologist the information necessary for satisfactory studies and interpretation of findings.

Case Reports: Value and Limitations of Barium Enema in Distal Sigmoid and Rectum

- *Case I:* J. J., an elderly woman complaining chiefly of diarrhea had a large polypoid mass palpable in the rectum.

The barium enema (Fig. 1) also clearly shows the large filling defect in the rectum.

Comment: Although the diagnosis of rectal tumors depends primarily on the digital and direct examinations, radiologic methods are useful to outline the extent of large lesions.

From the Department of Radiology, Good Samaritan Hospital, Suffern, New York.

FIG. 1. Case I: Large filling defect in rectum due to carcinoma. X-ray useful to demonstrate extent of a large lesion.

FIG. 2. Case II: Filling defect (arrow) on right lateral rectal wall, due to carcinoma. It would be difficult to differentiate this from a fecal mass, unless the proctoscopic findings were known.

FIG. 3. Case III: Large carcinoma of the ascending colon (arrows). An associated small rectal carcinoma found on direct examination cannot be visualized.

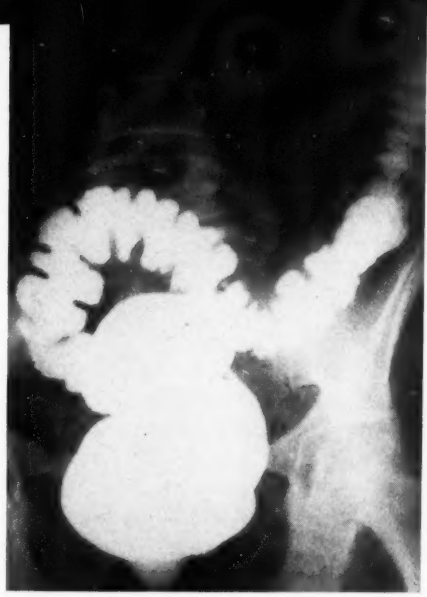


FIG. 4. Case IV: Carcinoma of recto-sigmoid. A. (above) Lesion not visualized at first examinmation. No sigmoidoscopy. B. (below) Fifteen months later, a large tumor. Cancer missed early due to failure to sigmoidoscope and undue reliance on x-ray for demonstration of a low lesion. False feeling of security led to long delay before re-examination.

• *Case II:* G. H., a 30-year-old man had rectal bleeding of two weeks' duration followed by a profuse rectal hemorrhage and collapse. A mass was felt in the rectum and sigmoidoscopy revealed a tumor 4 cm. in diameter on the right posterior rectal wall one inch above the anus.

On the barium enema (Fig. 2) a small filling defect is seen on the right lateral wall of the rectum.

The biopsy was positive for adenocarcinoma and the tumor was removed by abdomino-perineal resection.

Comment: This lesion was easily found by direct methods. On x-ray alone it would be difficult to differentiate from a fecal mass. A barium enema should not be depended on for diagnosis of a rectal tumor.

• *Case III:* E. R., female, age 66, had attacks of upper abdominal pain, belching, flatulence, nausea and vomiting for four months. A mass was felt in the rectum. Proctosigmoidoscopy revealed an ulcerating tumor three inches above the anus on the posterior rectal wall. Biopsy was adenocarcinoma.

Barium enema (Fig. 3) fails to demonstrate the rectal tumor but reveals a large malignant tumor of the ascending colon.

A right hemi-colectomy was done first. The specimen contained an ulcerated adenocarcinoma 2.5 cm. in diameter. Five weeks later patient returned for abdomino-perineal resection. The rectum contained an ulcerated adenocarcinoma 1.5 cm. in diameter 5 cm. above the dentate line.

Comment: This case illustrates the

Presented before the Eleventh Annual Meeting and Teaching Seminar, International Academy of Proctology, N. Y. C., April 7, 1959.

value of a barium enema for detection of unsuspected pathology in the proximal bowel after a lesion has been discovered in the lower bowel by direct examinations. Note, however, that if a barium enema had been relied upon alone, the rectal tumor would not have been detected.

• *Case IV:* A. F., a 47-year-old woman was hospitalized with a three-day history of abdominal pain, distention and inability to move bowels. Eight months ago, pan-hysterectomy had been done because of uterine fibroids. Admitting diagnosis was intestinal obstruction. Symptoms subsided after a cleansing enema. Proctosigmoidoscopy was not performed.

Gall bladder and upper gastrointestinal series were negative. Barium enema (Fig. 4A) showed only some spasticity of the bowel.

Fifteen months later, she was readmitted because of intermittent vaginal bleeding. Intermittent diarrhea had been present since the previous admission. On vaginal examination, a cauliflower tumor mass was visible in the vaginal vault. Biopsy showed adenocarcinoma.

The barium enema (Fig. 4B) now demonstrates a large recto-sigmoid carcinoma.

Comment: In this instance the lesion was missed because of undue reliance on x-ray for demonstration of a low lesion and failure to perform sigmoidoscopy. The long delay in re-examination prevented this patient from coming to the surgeon with a reasonable chance of cure.

Obstructive Lesions of the Sigmoid

• *Case V:* M. M., female, age 50, complained of rectal bleeding and left

FIG. 5. Case V: Typical obstructing carcinoma of sigmoid, showing a filling defect (arrow), destruction of mucosal pattern and constriction due to infiltration of the wall.

FIG. 6. Case VI: Carcinoma in proximal sigmoid colon (x) and endometriosis of distal sigmoid (o). Oblique view.

lower quadrant gurgling for one year. Sigmoidoscopy was negative for seven inches. The barium enema (Fig. 5) shows a typical deformity of carcinoma, with almost complete obstruction. This was removed by an anterior resection.

Comment: This case is presented as an illustration of a typical radiographic appearance of carcinoma. The film shows the filling defect destruction of mucosal pattern and narrowing of the lumen due to infiltration of the wall.

• *Case VI:* A.D., a woman, age 37 complained of bloody diarrhea for a week before menstrual periods, for about six months. On proctoscopy narrowing of the lumen was found at 8½ inches. A tender mass was palpable in the left parametrium.

The barium enema (Fig. 6) reveals two constricting lesions of the sigmoid colon. The upper lesion has the lipped margins of an infiltrating tumor. The lower constriction could represent a tumor or an inflammatory reaction.

At operation a carcinoma was found in the upper segment. The distal lesion was involved in a pelvic mass containing the chocolate cysts of endometriosis.

Comment: This case is presented as an interesting example of multiple sigmoid lesions. Involvement of the colon by endometriosis is not an unusual occurrence;[2] although the finding of carcinoma and endometriosis in adjacent segments is rare. It is not uncommon to encounter other combinations of lesions such as diverticulitis, granuloma, carcinoma and polyp.

• *Case VII:* N.G., male, 83, gave a history of passing fresh drops of blood after bowel movements for about six months. A papillary, friable tumor seeping mucus and blood was seen through the sigmoidoscope at 9 inches. Biopsy revealed adenocarcinoma.

The barium enema (Fig. 7) discloses a filling defect characteristic of carcinoma proximal to which are numerous diverticula, deformity and an evident obstruction.

The findings of cancer and diverticulitis were confirmed at operation and pathologic examination.

Comment: This case illustrates the association of cancer and diverticulitis. It is apparent that with a greater degree of inflammatory reaction or overlapping adherent loops, the typical appearance of the carcinoma could be obscured.

• *Case VIII:* T.C., a 54-year-old man, had a three-week history of anorexia, lower abdominal pain and an urge to stool while eating. Sigmoidoscopic biopsy revealed rectal mucosa with chronic inflammation.

The barium is completely obstructed (Fig. 8) at the lower sigmoid, a few diverticula are shown; nothing can be said as to the nature of the obstruction.

Findings at operation were multiple diverticula of the sigmoid, induration and thickening of the sigmoid which was adherent to the pelvic wall and small pericolonic abscesses.

Pathologic examination of the resected bowel showed diverticulitis with inflammation extending into the attached fat.

Comment: In this type of obstructing sigmoid lesion, it is impossible to differentiate a benign from a malignant lesion. Inflammatory reactions secondary to ulcerating carcinoma or due to associated diverticulitis may mask the radiologic signs of malignancy. Early surgery is effective therapy for the benign lesion and also offers the only

FIG. 7. Case VII: Obstruction of proximal sigmoid colon by diverticulitis. Carcinoma of distal sigmoid colon (arrow).

FIG. 8. Case VIII: Obstructing lesion of sigmoid proven at surgery to be due to diverticulitis. Cancer cannot be excluded on radiologic examination. This is an indication for surgery.

FIG. 9A

FIG. 9. Case IX: Obstructing sigmoid lesion, later proven to be cancer. A, lateral view of first examination showing complete obstruction of the barium enema; carcinoma suspected. B & C, over one year later, sigmoid deformity again found but uncertain whether benign or malignant, radiologically. Clinically malignant disease present; operation performed, inoperable. Surgery should not be withheld while awaiting development of pathognomonic signs of cancer.

reasonable chance of cure of the malignant one.

Withholding surgery while waiting for pathognomonic radiographic signs to develop may be tragic as indicated by Case IX.

• *Case IX:* W.B., a man, aged 70, was first admitted with symptoms of partial colon obstruction. The barium enema (Fig. 9A) was reported as "obstructing lesion of the sigmoid, probably malignant." On sigmoidoscopy no lesion was visualized.

The barium enema, repeated three weeks later, showed relief of the obstruction and deformity of the sigmoid which was now deported as probably inflammatory. Sigmoidoscopy was repeated with failure to visualize the pathological process.

Over one year later, the patient returned for re-examination. He had had intermittent diarrhea during this time and for the past three months, there was bloody stool, weight loss, lower abdominal pain and distention. The proctoscopic examination was again not diagnostic. The barium enema (Figs. 9, B and C) shows a deformed sigmoid but with uncertainty as to whether it is benign or malignant.

Finally, sixteen months after the initial visit, an operation was performed with the finding of an advanced inoperable tumor of the sigmoid adherent to the bladder.

Comment: This case displays the difficulty often encountered in deciding whether a visualized lesion is benign or malignant. Surgery is indicated when it is impossible to exclude cancer radiologically and should have been done on this patient on the first admission.

Colon Lesions with Symptomatology Simulating Upper Gastrointestinal Disease

• *Case X:* A.S., male, aged 72, was

FIG. 9B

FIG. 9C

FIG. 10. Case X: Obstructing carcinoma of cecum. Elderly patient referred first for upper G.I. Series. A (top), Four-hour G.I. film showing dilated small bowel filled with barium. B, Barium enema reveals large cecal tumor involving ileo-cecal valve. Elderly patients with atypical symptoms of gastric lesion may have an obstructing colon tumor. Plain abdominal films and barium enema should precede the upper G.I. Series.

well until one month previously when there was onset of anorexia, indigestion, vague right abdominal pain and constipation. He was referred as an out-patient for upper G.I. Series (Fig. 10A). Marked small bowel distention is visible on both the radiograph of the stomach and on the four-hour films. The barium enema (Fig. 10B) done four days later shows a large cecal tumor mass with obstruction of the ileocecal valve. By this time the patient was distended and vomiting. Decompressive ileostomy had to be done prior to the colectomy. The specimen showed a bulky adenocarcinoma distorting the ileocecal valve.

Comment: Several similar cases have been encountered in which patients with obstructing colon tumors have been referred for upper G.I. Series because of symptoms of anorexia, nausea and vomiting which appear as the obstruction becomes complete. The patients have usually been elderly and apparently unaware of any disturbance of the bowel, until those of obstruction appear. However on questioning, a history of increasing constipation or change in bowel habit of a few months duration can usually be obtained. The obstructing lesions have been found in sigmoid, splenic flexure, transverse colon, as well as cecum. It is advisable to consider the possibility of an obstructing colon lesion in an elderly patient with atypical gastrointestinal complaints. Plain films of the abdomen and barium enema should then precede the upper G.I. studies.

• *Case XI:* M.S. is a man, age 62, whose illness began seven weeks previously with an attack of generalized abdominal pain which gradually subsided after a few days, leaving vague lower abdominal discomfort. There were several subsequent attacks of recurrent

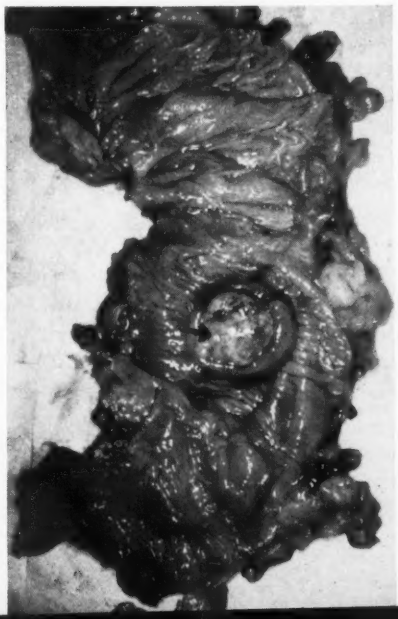


FIG. 11. Case XI: Intussusception due to lipoma of cecum. A (top), film from a gall bladder series showing a radiolucent round shadow (arrow) representing the intussuscepted fatty tumor. B, intussuscepting tumor demonstrated on barium enema (arrow). C, photograph of resected specimen. Arrow points to ulcerated surface of the lipoma. Chronic recurrent intussusception due to right colon tumors must be considered in differential diagnosis of obscure abdominal conditions.

vague upper pain of moderate severity accompanied by nausea and anorexia. Attacks were increasing in severity and frequency and there was a ten-pound weight loss since the onset. Physical examination revealed only tenderness in the upper right quadrant of the abdomen.

The gall bladder series (Fig. 11A) was requested first and reveals normal visualization without stones. Note the round radiolucent shadow below the gall bladder.

The barium enema (Fig. 11B) demonstrates an intussuscepting tumor at the hepatic flexure.

By the time of operation ten days later the intussusception had become spontaneously reduced. The resected specimen (Fig. 11C) shows a polypoid tumor in the cecum covered with mucous membrane except for the ulceration over the tip. The histologic examination revealed a lipoma.

Comment: The radiolucency noted on the gall bladder series represents the radiolucent fat of the tumor in contrast with the surrounding bowel contents. The position of this shadow indicates that intussusception was present at the time also, three days prior to the barium enema.

Wasch and Epstein[8] have pointed out

that chronic, recurrent intussusception in adults due to right colon tumors must be considered in the differential diagnosis of obscure abdominal conditions. The clinical picture presented is that of repeated episodes of pain in the right lower quadrant radiating to the epigastrium and substernal regions with nausea, anorexia and vomiting, bloody stools and a palpable mass in the right abdomen.

Inconclusive Diagnosis due to Failure to Supply the Radiologist all of the Clinical Data

• *Case XII:* Mrs. B. had been hospitalized for about two weeks because of cramps and diarrhea. About twenty years ago, she had resided in Japan where she contracted "dysentery." Thereafter, she had had attacks of diarrhea. A barium enema performed five years ago revealed "mucous colitis." Sigmoidoscopic examination, shortly after admission, was negative.

A barium enema was requested two weeks after admission with a clinical diagnosis of "colitis." A large filling defect is seen in the cecum surrounded by concentrically arranged mucosal folds (Fig. 12A). After another two week interval, a repeat examination showed a marked change with only a small remaining defect in the cecum suggestive of a slightly prominent ileo-cecal valve (Fig. 12B). The radiologic diagnosis was in doubt. The possibility of an intermittently intussuscepting small bowel tumor was suggested.

The symptoms subsided; the patient was discharged from the hospital and remained well. She returned for elective exploratory laparotomy six weeks after onset of symptoms. A ruptured appendix was found with a subsiding appendiceal abscess. The appendiceal tip was sealed into a small (3 cm. diameter) plaque-like mass of necrotic material lying against the wall of the cecum.

Comment: When the films were reviewed after the operation, it was learned from the patient's family physician who had treated her at the onset, that the diagnosis originally considered had been appendicitis. She had complained first of right lower quadrant and suprapubic pain which lasted three days. Because the physical findings and blood count were equivocal, surgery was postponed and she was observed. With the onset of diarrhea, the diagnosis was changed to colitis. It is reasonably certain that appendiceal abscess could have been diagnosed on the basis of the barium enema studies and history, had an accurate clinical report been supplied to the radiologist.

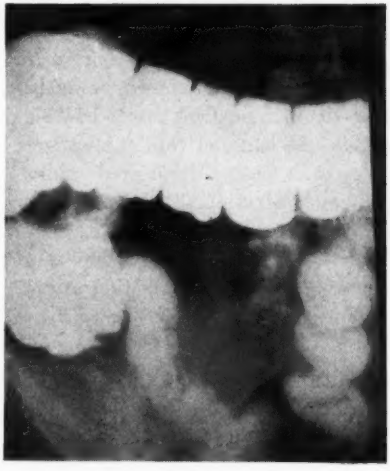
Undue Reliance on X-Ray Examination: Failure to Obtain Early Re-Examination

• *Case XIII:* S.C., a woman of 63, had profuse rectal bleeding for two months and complained of weakness, dizziness and fainting. Large ulcerated hemorrhoids with multiple bleeding points were found. Hemoglobin was 39%. Sigmoidoscopy was negative for 24 cm. The barium enema (Fig. 13A) was reported negative. The radiolucency seen in the cecum was considered to be gas or stool. She was given four blood transfusions of 500 cc. each. Hemorrhoidectomy was performed. At time of discharge on the eighth postoperative day, hemoglobin was 59%.

Four months later because of persistent anemia, (hemoglobin 65%) a repeat barium enema was requested. This reveals a huge carcinoma of the cecum (Fig. 13B). Hemi-colectomy was done

FIG. 12. Case XII: Appendiceal abscess. A (left), cecal filling defect with concentrically arranged mucosal folds. B, defect in cecum much smaller two weeks later. A conclusive diagnosis was prevented by failure to supply the radiologist with all of the clinical findings.

FIG. 13. Case XIII: Carcinoma of cecum. A (left), the first barium enema revealed a radiolucency in the cecum misinterpreted by the radiologist as gas or stool. B, repeat barium enema four months later demonstrates a large carcinoma of the cecum. A negative x-ray report should not lead to a false feeling of security and failure to insist on early re-examination when there are persistent signs and symptoms.



with removal of a large ulcerating adenocarcinoma.

Comment: There are two sources of error in radiologic examinations. It may be impossible to visualize the lesion as discussed earlier; or the abnormality may be demonstrated but not properly interpreted.

The filling defect seen on the first colon x-ray was misinterpreted by the radiologist as gas. Undue reliance on the radiologic examination prevented the clinician from obtaining an early restudy which was indicated by persistent anemia at time of discharge. The clinician must assume the responsibility for insisting on early re-examination on the basis of persistent symptoms and signs.

Summary Selected cases involving problems in diagnosis of colon lesions have been reported in order to re-emphasize the following principles.

1. A report of negative findings on barium enema examination should not be relied upon to exclude a lesion of the lower sigmoid or rectum. The digital and procto-sigmoidoscopic examinations cannot be dispensed with. Although even small lesions can at times be shown radiologically, in diagnosis of rectal lesions, the barium enema is chiefly useful in demonstrating the extent of large tumors and revealing associated pathology higher up.

2. Obstructive sigmoid lesions require early surgical treatment because differentiation of a benign from a malignant process may be impossible on the x-ray. The inability to exclude cancer radiologically is an indication for surgery. Carcinoma may be readily mistaken for diverticulitis. An additional indication is the present tendency to offer surgical treatment early in cases of diverticulitis.[4]

3. Due to obstruction or intussusception, the chief symptoms of a colon lesion may be epigastric distress, anorexia, nausea and vomiting simulating a gastric lesion. In the presence of such atypical upper abdominal symptoms, the possibility of a colon lesion should be considered. Preliminary plain abdominal films and barium enema should then be requested prior to a gall bladder or upper gastrointestinal series.

4. There must be close cooperation between radiologist and the clinician. The radiologist must be supplied with all the clinical data. This may allow a conclusive diagnosis to be reached in the face of confusing x-ray findings; or the radiologist's attention may be directed toward carrying out special maneuvers. The notation of blood coming down from above on sigmoidoscopy should be made known to the radiologist. The clinician should view the films with the radiologist in order to be sure there is no "gap" of unexamined bowel between the highest point reached by sigmoidoscopy and the lowest loop seen on x-ray. Even experienced radiologists may occasionally incorrectly interpret a lesion. The clinician, therefore, must assume the responsibility of requesting early re-examination after a "negative" report.

Conclusions

Pitfalls in radiologic diagnosis of the colon have been illustrated. It is re-emphasized that the clinician should avoid a blind belief in the infallibility of the x-ray examination. A barium enema cannot serve as a substitute for careful clinical investigation by history, abdominal, digital and procto-sigmoidoscopic examinations.

Clinical findings and suspicions must be made known to the radiologist, and persistence of symptoms requires early repeat examinations.

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Dissemination of Cancer Cells at Operation

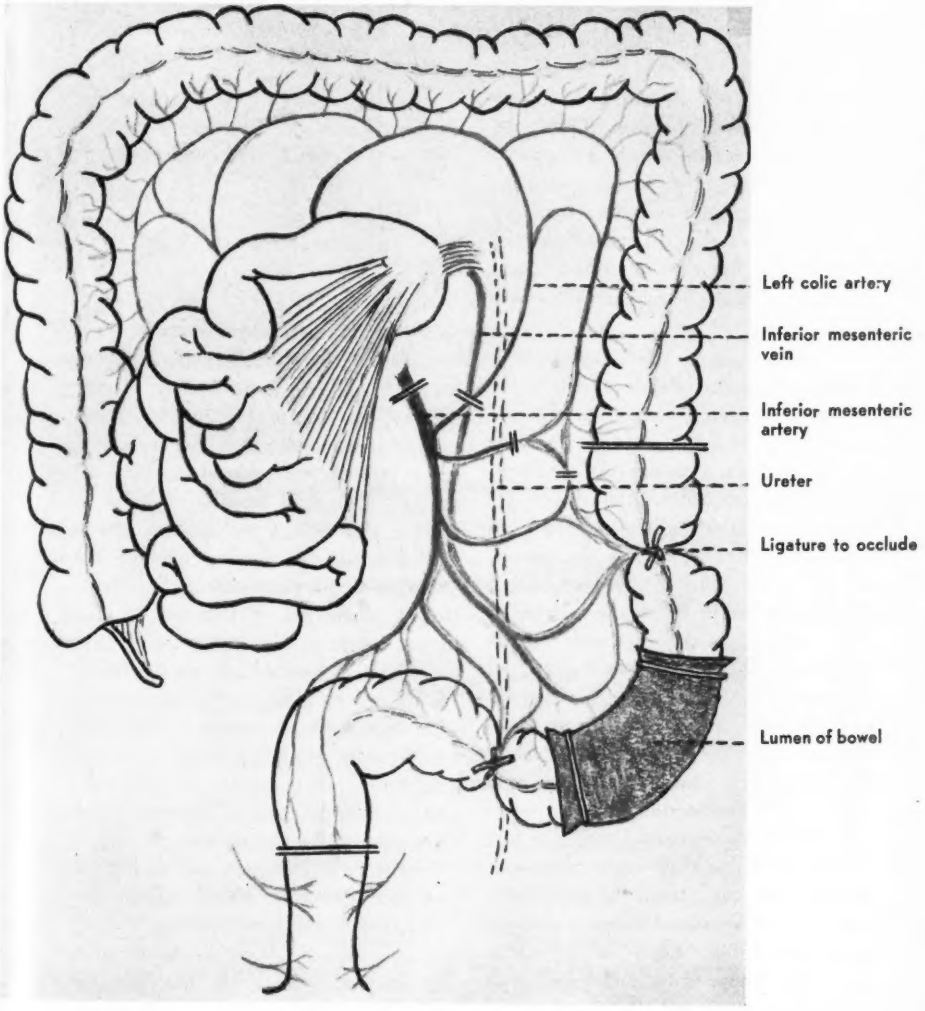
COLIN McPHERSON, M.D.
Woodstock, Ontario, Canada

The importance of the dissemination of cancer cells during operation has been brought to our attention repeatedly in the recent literature.

Cancer is spread not only by direct extension along tissue planes and by the lymphatics, but by way of the vascular channels and by implantation; implantation of malignant cells into the operative wound or the peritoneal cavity, or on to the suture line of an intestinal anastomosis.

Measures are now being used in an attempt to control this metastatic spread of cancer at the time of operation.[1,4] Primary ligation of the venous channels draining the area of a colon tumor should be done first, before any operative manipulation is carried out on the growth. Massage or handling of a tumor causes a shower of malignant cells into the venous trunks. The second preliminary step should be the occlusion of the lumen of the bowel, (including its marginal vessels) a few inches above and, where possible, below the growth, by a heavy ligature, in order to prevent desquamated cancer cells from spreading along the lumen of the bowel during the subsequent manipulation. Malignant cells have been found as far as 35 cm. from the growth following such manipulation. These viable cells, while not able to become attached to the intact mucous membrane, may become implanted and grow at the suture line of the anastomosis. Warren Cole has reported eight smears taken just outside such ligatures were negative, whereas seven of eight smears taken within the area of the ties were positive for malignant cells.[4] The reports of Cole and others indicate a ten percent recurrence rate at the anastomotic suture line before these preventive measures were instituted. In addition, the portion of bowel containing the growth should be covered to minimize the desquamation of serosal

Presented at the Twelfth Annual Teaching Seminar of the International Academy of Proctology, Miami Beach, Florida, April 23-28, 1960.


Left colic artery
Inferior mesenteric vein
Inferior mesenteric artery
Ureter
Ligature to occlude
Lumen of bowel

cancer cells and peritoneal implantation.

It has been shown[2] that viable tumor cells are present in both the peripheral blood and the blood draining the tumor site in from forty to sixty percent of patients with cancer. The proportion of patients in whom circulating tumor cells can be found is increased by the trauma of operation. The detection of tumor cells in the blood, however, does not mean that the patient will necessarily develop metastases, as many cases with such findings have survived five or more years.[3] Many malignant cells must disseminate into the circulation in all cases but only a few such cells remain viable and grow.

Recently, attempts have been made to attack these loose cells, dislocated at the time of operation, by chemotherapeutic measures. It is assumed that these free floating cells are vulnerable to carcinocidal agents, before they have acquired a vascular pedicle and have become established metastases. At present, we are using Nitrogen Mustard. This drug is similar in its effects to irradiation, inhibiting cell division in its premitotic phase. A freshly prepared solution of Nitrogen Mustard is injected into the lumen of the bowel, into the peritoneal cavity and used to irrigate the operative wound and the perineal wound after abdomino-perineal resection. Collier showed experimentally that wounds which had been inoculated with cancer cells and then irrigated with water or with normal saline one hour later, gave 100% "takes" of the malignant cells. Those wounds irrigated with Chlorpactin 2%® (which is too strong for clinical use) gave 5% "takes," and those irrigated with Nitrogen Mustard 1 mgm.% gave 3% "takes."

Clinically, Nitrogen Mustard is used as a 2 mg.% solution (10 mg. in 500 c.c. of physiological saline) freshly prepared, to irrigate the operative wound, and to inject into the lumen of the bowel, above and below the occluding tapes in sufficient quantity to distend the gut. This fluid may be removed by suction just before the anastomosis is made. A second solution of Nitrogen Mustard containing 0.3 mg./Kg. body weight, disssolved in sufficient physiological saline to give a 2.5 mg.% concentration, is inserted into the peritoneal cavity before closing the peritoneum. This solution acts locally in the peritoneal cavity and being readily absorbed into the portal circulation, it is assumed it will attack the loose cancer cells which have entered the portal veins.

TABLE II NITROGEN MUSTARD (Mechlorethamine)

Solutions (Must be freshly prepared)

1. 10 mgm. in 500 c.c. of physiological saline
   ——to inject into the lumen of the bowel and
   ——to irrigate the operative wound.
2. 0.3 mgm./Kg. body weight in sufficient saline to give a concentration of 2.5 mgm.%.
   (ex. —70 Kg.(154 lb.)—21 mgm. in 840 c.c. saline)
   ——to be instilled into the peritoneal cavity.
   (Maximum dose 25 mgm.)

The work of McCredie and de Peyster in Cole's laboratory[5] would indicate that in patients with gastrointestinal cancer, Nitrogen Mustard may be more effective when it is all given into the peritoneal cavity, rather than by a combination of intraportal, intraperitoneal and systemic venous injections.

Complications in the use of Nitrogen Mustard have been minimal. Most pa-

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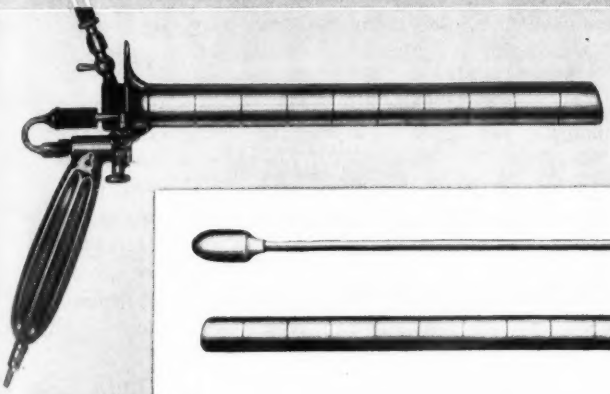
*"A Sigmoidoscope with Proximal and Distal Illumination", Surgery, Vol. 25, No. 4, April 1949.



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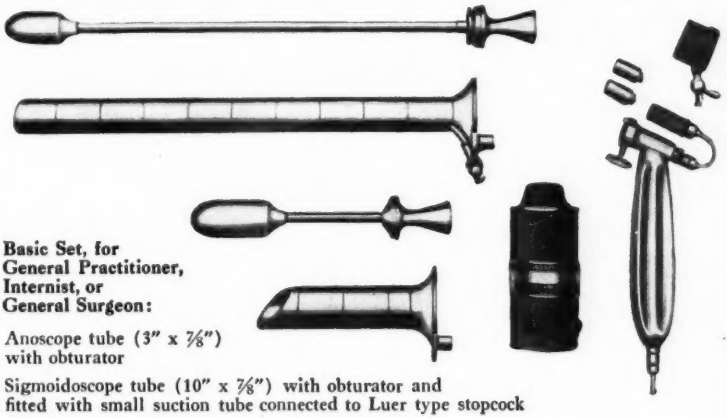

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tients show no effects other than feeling a little sicker than usual. Transient nausea and vomiting, which is occasionally seen, is easily controlled by sedatives and antiemetic drugs. Depression of bone marrow has been reported in the literature.[3] There is an initial leukocytosis appearing in the first and second postoperative days, followed by a leucopenia reaching its lowest level (3500 cells per cm.) on the twelfth to fourteenth day. It has been suggested that the white cells and the platelets be counted on the first, fourth, seventh and fourteenth postoperative days. Cole has recommended that no patient be given Nitrogen Mustard at operation unless the white cell count is greater than 5000 cells per cm. and the platelet count 150,000 cells per cm. Antibiotics are given if the white cell count falls below 4000 cells per cm. Blood is given if the hematocrit level falls below normal. To avoid overdosage in obese persons, no person is given more than 25 mg. of Nitrogen Mustard. Patients over 70 years-of-age are given half the usual computed dose. The use of this solution appears not to interfere with wound healing or the "take" of a skin graft.

Summary

An attempt should be made to prevent dissemination of cancer cells during operation, first, by mechanical isolation of the tumor as a preliminary step. This includes ligation of the vascular pedicle, occlusion of the bowel lumen together with its marginal vessels by ligature ties, and by placing a protective covering over the tumor itself. The second measure is the use of a carcinocidal agent, preferably Nitrogen Mustard, to destroy free loose malignant cells which have contaminated the wound, have spread along the lumen of the bowel, or have entered the portal circulation.

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Therapeutic Abstracts

Rectal Perforations After Enema Administration

Four case histories are presented of patients who sustained traumatic perforations of the rectum while in hospital. Three of the patients were receiving barium enemata at the time of perforation, while in the fourth, the rupture occurred during administration of an evacuant enema. Two of the perforations were intraperitoneal and two extraperitoneal; one patient in each group died as a direct result of the accident.

The frequency and etiology, as well as anatomical and physiological factors important in the production of rectal rupture, are discussed. Therapy should consist in early operation with establishment of proximal diversionary colostomy; this should be combined with vigorous medical support.

CHARLES G. ROLAND, M.D., B.Sc.
and
ARNOLD G. ROGERS, M.D., M.Sc.
The Canad. Med. Assn. (1959) Vol. 81, No. 10, pp. 815-818

Fatty Liver

The fatty liver produced by chloroform poisoning was studied in the white rat. The compound was inhaled and its effects on the liver were determined by biochemical and histochemical techniques.

The fatty liver is essential glyceridic and the lipidic accumulation affects almost only free lipids. It appears with a twelve-hours-poisoning and reaches its maximum within 24 hours.

The percentage of protein-bound phosphatides diminishes, a part of which is free, mixed with glycerides.

Cellular structures, mitochondries and microsoms showed little changes. Histologically, hepatic cells showed a lipidic excess, the highest for 24 hours, leading to a hydropic necrosis if poisoning was continued, with lobules invaded with macrophagic reticular cells.

P. F. CECCALDI, S. HERBERT AND J. BIEZ-CHARRETON
(Laboratorire d'Histologie de la Faculté de Médicine de Paris, France)
Sem. Hop./Arch. de Biol. Méd., n°D, p. 303, (juin) 1956.

Association Between Diarrhea and Adenovirus Type 7

An outbreak of diarrhea and vomiting is described in which adenovirus type 7 was isolated from the stools in 10 cases. Six of them were associated with Sh. sonnei and a number of these showed respiratory symptoms.

All cases except one adult contact were aged 5 years or less.

Cases of Sonne dysentery and non-bacterial diarrhea, in this age group but from other areas, were examined for the presence of adenovirus with negative results.

The faeces of 50 normal children were also negative, with one exception when an adenovirus type 6 was isolated.

The possible role of adenovirus in this outbreak is discussed.

P. S. GARDNER, M.B., C. B. MCGREGOR, M.B., and K. DICK, M.B.
Brit. Med. J. (1960) No. 5166, pp. 91-93

Newer Medicinals

Aquamephyton, Merck Sharp & Dohme, Division of Merck & Co., Inc., West Point, Pennsylvania. Injectable aqueous colloidal solution containing, in each 1 cc. vial, 10 mg. of vitamin K_1. Indicated in surgical and obstetrical situations where there is bleeding or danger of hemorrhage because of low prothrombin level; to counteract prothrombin-depressing drugs such as coumarin compounds and indanediones; to supply vitamin K_1 when there is either lack of synthesis or absorption in the individual. **Dose:** Varies with the condition to be treated and with the patient's response. **Sup:** Vials of 1 cc.

Decaspray, Merck Sharp & Dohme, Division of Merck & Co., Inc., Philadelphia, Pennsylvania. Topical aerosol containing, in each 90 Gm. container, 10 mg. dexamethasone and 50 mg. neomycin sulfate. Indicated in the treatment of allergic dermatoses, insect bites, sunburn, diaper rash, neurodermatitis, atopic dermatitis and pruritus ani. Administration: Apply to affected areas from a distance of about six inches. **Sup:** Aerosol containers of 90 Gm.

Declostatin, Lederle Laboratories Division, American Cyanamid Company, Pearl River, New York. Capsules, each containing 150 mg. Declomycin demethylchlortetracycline and 250,000 units nystatin. Indicated for the treatment of tetracycline-sensitive infections whenever intestinal overgrowth of monilia is a potential hazard. **Dose:** Average adult dosage is 1 capsule four times a day or 2 capsules twice a day. **Sup:** Bottles of 16 and 100.

Es-A-Cort Lotion, Dome Chemicals, Inc., New York, New York. Each ounce contains 100,000 U.S.P. units vitamin A, 56,000 I.U. estrone and 1/2% micronized hydrocortisone alcohol. Indicated for rapid and effective relief of pruritus vulvae. Also useful in senile vulvovaginitis, postmenopausal vaginitis, kraurosis vulvae and related conditions. **Use:** Apply sparingly to affected area twice daily. **Sup:** Bottles of 1/2 oz. and 2 oz.

Permitil Chronotabs, White Laboratories, Inc., Kenilworth, New Jersey. Chronotabs containing 1 mg. fluphenazine dihydrochloride, half of which is in the outer coating for immediate absorption and half in the barrier-protected inner core for sustained action. Indicated to provide relief from ordinary anxiety and tension without impairing alertness for 14 to 15 hours. **Dose:** One tablet daily. **Sup:** Bottles of 50.

Polymagma Tablets, Wyeth Laboratories, Philadelphia, Pennsylvania. New convenient tablet form containing 25,000 units polymyxin B sulfate, 75 mg. dihydrostreptomycin base- (as sulfate), 350 mg. activated attapulgite, 45 mg. pectin, and 70 mg. hydrated alumina powder. Indicated for the control of bacterial diarrhea. **Dose:** Adults, 2 tablets initially, then 2 after each loose bowel movement. For children and infants, suggest use of Polymagma Suspension. **Sup:** Bottles of 48.

Riopan, Ayerst Laboratories, Inc., New York, New York. Monalium hydrate (hydrated magnesium aluminate). Indicated in conditions associated with gastric hyperacidity, such as gastric or duodenal ulcer, gastritis, heartburn, gastrointestinal disturbances resulting from dietary indiscretions, nervous disorders, food intolerances, excessive smoking or alcoholic stimulation. **Dose:** 1 or 2 tablets swallowed with water as required, preferably between meals and at bedtime. 1 or 2 teaspoonfuls of suspension with water as required, preferably between meals and at bedtime. **Sup:** 400 mg. tablets in packages of 60 and 500, in individual filmstrips of 10 tablets. Mint-flavored suspension, each teaspoonful of which contains 400 mg. monalium hydrate, in bottles of 12 oz.

Striatran, Merck Sharp & Dohme, Division of Merck & Co., Inc., Philadelphia, Pennsylvania. Emylcamate, 200 mg. per tablet. New, highly effective tranquilizing agent for relieving mild anxiety and tension. Primarily a tranquilizer, it has some muscle-relaxant activity. **Dose:** Usual adult dose is 1 tablet three to four time daily, immediately before meals. **Sup:** Pink tablets in bottles of 100.

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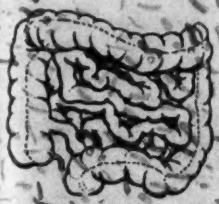

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BOOK REVIEWS FOR PROCTOLOGISTS

NUTRITION AND ATHEROSCLEROSIS by Louis N. Katz, M.D., Director, Cardiovascular Department, Medical Research Institute Michael Reese Hospital; and Professional Lecturer in Physiology, University of Chicago, Chicago, Illinois. Jeremiah Stamler, M.D., previously Assistant Director, Cardiovascular Department, Medical Research Institute, Michael Reese Hospittal, Chicago, Illinois and Established Investigator of the American Heart Association; presently Director, Heart Disease Control Program, Chicago Board of Health, Chicago, Illinois. Ruth Pick, M.D., Assistant Director, Cardiovascular Department, Medical Research Institute, Michael Reese Hospital, Chicago, Illinois and Established Investigator of the American Heart Association. Pages 143, with 67 illustrations. Published by Lea & Febiger, Philadelphia, 1958.

Although this book appeared in 1958, it is worthy of a review at this late date. There has been increasing interest in the relationship between nutrition and atherosclerosis, and this little volume has much to offer.

It is based on the 1956 Henry Jackson Lecture of the New England Cardiovascular Society, naturally expanded and brought up to the 1958 date.

The reader will appreciate the positive practical suggestions both for prophylaxis and therapy.

NONPENETRATING INJURIES OF THE ABDOMEN By Robert H. Kennedy, B.A., M.D., F.A.C.S., Consulting Surgeon, Beekman-Downtown, Bellevue and University Hospitals; Formerly Professor of Clinical Surgery, New York University Postgraduate Medical School, New York City, Pages 106. Published by Charles C. Thomas, Bannerstone House, Springfield, Illinois. 1960.

This excellent little volume covers blast injury and many other interesting non-penetrating injuries of the abdomen. Proctologists will find a brief chapter on the colon and the rectum. Such conditions in this region are quite rare.

The text is well written, and covers the subject well in monograph form.

The importance of the subject is readily recognized when we consider the great speeds of automobile and air travel, and the tremendous frequency of automobile accidents. We must always remember that the human body assumes the speed of the vehicle at the instant of impact. Resulting internal injuries certainly test the best diagnostic skill.

The volume is recommended for the internist and the general surgeon who see such cases, and for emergency room reference and study.

CHRISTOPHER'S TEXTBOOK OF SURGERY— Seventh Edition edited by Loyal Davis, M.D., Chairman of the Department of Surgery, Northwestern University Medical School. Published by W. B. Saunders Company, Philadelphia, London, 1960. 1551 Pages. With 1597 illustrations on 810 figures. Price $17.00.

The Seventh Edition of this classic textbook is fully revised to include all the modern contributions of the basic sciences. The textbook is for the student of Surgery, but will be useful to the advanced surgeon as well.

Naturally, it is not intended to be an encylopedia of surgery. Nevertheless, it does provide an extensive consideration of general surgery, and is fundamentally sound.

The contributors are all authorities in their respective fields. The proctologist will find an especially good section on the colon by Welsh, and on the anus and rectum by Nesselrod.

This text is recommended without reservation for the medical student, and also for the general surgeon's library.

SAFE HANDLING OF RADIOACTIVE ISOTOPES IN MEDICAL PRACTICE by Edith Quimby, Sc.D., is Professor of Radiology at the College of Physicians and Surgeons, Columbia University. 129 Pages. Published by the MacMillan Company, 1960. Price $4.50.

This book is intended to guide those who use radioactive isotopes in hospitals or medical practice. A radiation protection officer is required in every radioisotope laboratory, but this excellent book provides information that will be useful to laboratory medical personnel if the radiation protection officer should be absent in emergency.

There is basic information on the nature of radioactivity, diagnostic and therapeutic uses of radioactive isotopes, precautions for the hospital and the laboratory, patient care instructions following administration of isotopes, etc.

This excellent little volume is recommended for doctors, nurses, technicians and all personnel who work with radioactive isotopes either in medical practice or in hospitals. It is highly authoritative and should be made available to all such personnel.

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(1) Brooks, L. H.: Dis. of Colon & Rectum, v. 1, no. 5, 1958

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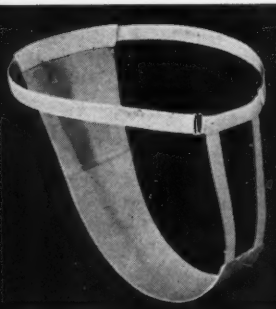

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